

Millersville's own “blue man group” conducts research in the Mojave Desert

A group of scientists and Millersville University undergraduate meteorology students – all part of team Galactica – are photographed in the shortwave infrared creating this false color image. The Millersville team can be seen in their black Millersville University caps, which appear yellow in this image.

In late October 2011, Dr. Richard Clark, earth sciences, and seven undergraduate students with their trailer in tow, traveled 2,600 miles to the Mojave Desert to measure the concentration and size distribution of dust and other particulates in the lower



atmosphere. The project, funded by the Defense Advanced Research Projects Agency (DARPA), took place during intensive military training operations on Fort Irwin, Calif., just north of the Mojave Desert. Ft. Irwin is the National Training Center for U.S. Army troops deployed overseas. The main objective, says Clark, was to determine the number of particles over a range of sizes to an altitude of 1,000 meters.

Equipped with a 15-foot-diameter tethered balloon and suitable rigging to carry a 45-pound payload that included a particle sizer, GPS, batteries, onboard computer and ancillary electronics, the Millersville team profiled the atmosphere while research aircraft flew overhead surveying the landscape with downward pointing remote sensing devices. Knowledge of the concentration and size distribution of dust is vitally important to a satellite or aircraft's ability to recognize the spectral signature of chemical species at the surface. Dust tends to obscure the measurement making it difficult to pinpoint the

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location of potentially dangerous chemicals. By knowing the concentration as a function of the size of the particle scientists can develop algorithms that can subtract out the attenuation due scattering and absorption by dust.

The Millersville team was on site for about two weeks. The team was divided into two groups, and with the help of a locally rented RV, the groups alternated with one group staying at the site while the other would drive back each night to a hotel in Barstow, California. “It is truly a marathon effort,” said Rebecca Pauly, “but one well worth it. We were totally exhausted by the end of the day.”

“I can't think of a better way to learn science than by doing science,” added Gregg McCambley, “and fieldwork provides such a great opportunity for that.”

“Spending two weeks in the Mojave Desert was phenomenal,” said Tim Juliano, “there were amazing sunrises and sunsets, wispy Cirrus clouds, low humidity and an occasional coyote.”

“There is very little difference between the experiences that these undergraduate students receive and what might be considered graduate student caliber,” said Clark. “A case in point, Michael Charnick, traveled alone to Fort Irwin three weeks before the field project commenced to conduct a site survey for our operations and those of Johns Hopkins University. He met with project principal investigators and military officers, which in itself could have been daunting for some students, but not for Mike. He not only handled himself in a professional manner, but he added value to their discussions and later developed detailed maps of the area in Google Earth that were used to define our airspace, and which were used to gain authorization from both the civilian and military airspace operations centers.”

“These students and the remainder of the team, Erica Dolinar, Phil Falgoust and Matt King, gave 150 percent to this project,” said Clark. “On one occasion a 50 mph dust storm plowed through our site at night. Balloons don't respond well to winds like this. For nearly two hours, while being blasted by wind-driven sand, the students stood their ground, making sure that the balloon would not leave its mooring. When the wind finally



subsided there was an intense feeling of accomplishment and satisfaction in having pitted of oneself against the forces of nature and coming out on top. For me, it was also feeling of immense pride. Never was there a moan or a complaint as muscles tired under the balloon's continuous jostling. Six hours later we were again ready to start research operations.”

The balloons, ranging in size from a car to a school bus, a trailer and more than \$1 million in instruments and equipment are part of the Millersville University Atmospheric Boundary Layer facility.